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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/747,837

12/29/2003

Hideyo Osanai

03-745

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7590

02/07/2006

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EXAMINER

NGUYEN, HOA CAO

ART UNIT

PAPER NUMBER

2841

DATE MAILED: 02/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/747,837

Applicant(s)

OSANAI ET AL. 

Examiner

Hoa C. Nguyen

Art Unit

2841

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2 PAGES</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. Applicant's election without traverse of group I, claims 1-7, in the reply filed on 1/5/06 is acknowledged. Claims 8-9 are cancelled.

#### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Metal/ceramic bonding substrate with minimal warpage.

3. The disclosure is objected to because of the following informalities: Page 7, line 12, the "head sink" must be changed to "heat sink".

Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagase et al. (US 6033787) in view of Elmoursi et al. (US 20030219576).

**Regarding claim 1**, Nagase et al., as shown in figure 8, disclose a metal/ceramic bonding substrate comprising:

- (a) A ceramic substrate 93 (see column 6, line 48);

(b) a metal circuit plate 92 (a copper plate to be circuit patterned, see column 6, lines 47-49 and 54-56) bonded to one side (top side) of the ceramic substrate;

(c) a heat sink member 91 (a copper plate for heat dissipation from the substrate to an external heat sink 76), one side of which is bonded to the other side (bottom side) of the ceramic substrate; and

(d) a metal plate 77 formed on the other side of the heat sink member 91.

The metal plate 77 with cover layers 77a on both sides is to firmly bond the external heat sink 76 to the heat sink member 91 without using soldering. However, Nagase et al. failed to disclose the metal plate is a work-hardened layer but an aluminum foil.

Etmoursi et al., as shown in figure 1, disclose a substrate 60 (which can be a ceramic substrate, see paragraph 54), a metal layer 62 (silver bond layer, see paragraph 22) formed on the substrate, and a layer of metal formed by plastic deformation copper particles 101 (kinetic spray, which is a shot peening technique) on the metal layer 62 (see abstract and paragraph 29). Etmoursi et al. further disclose that the plastic deformation particles can be used to form a thick layer having high-current and good thermal management capability (see paragraphs 2 and 5).

It is known in the art that shot-peening surface is an effective surface preparation for application of thermal forming to a substrate. The shot peening produces a plastically deformed surface that increases the surface residual stress on a substrate resulting a non-uniform distribution of stress along the cross section of the substrate to thereby increase the strength of the substrate.

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It is also noticed that shot-peening treatment is to densification and smoothing a surface of substrate are also well known in the art.

It would have been obvious to one having ordinary skill in the art at the time of invention was made to apply the teachings from Etmoursi et al. to form the layer 77 as a work-hardened layer on the other surface of the heat sink 91 instead of an aluminum foil to maximize thermal conductivity between the substrate and the external heat sink 76 and also to strengthen the heat sink 91.

**Regarding claim 2**, Nagase et al. and in view of Etmoursi et al. disclose every limitation as shown in claim 1 above.

**Regarding claims 3-5**, Nagase et al. and in view of Etmoursi et al. anticipate every limitation of the claims (see Nagase et al., table 1). It is also noticed that the structure is to improve thermal management and to minimize warpage. A defective range (ranges of unacceptable warpage) of a final product is depended upon a requirement(s) of an application and it is a matter of choice.

**Regarding claim 6**, Nagase et al. and in view of Etmoursi et al. disclose the metal circuit plate 92 and the heat sink member 91 contact the ceramic substrate 93 to be bonded directly to the ceramic substrate (see figure 8, column 6, lines 47-49).

**Regarding claim 7**, Nagase et al. and in view of Etmoursi et al. disclose every limitation as shown in the above claims and inherently include that a semiconductor chip soldered on the metal circuit plate 92 (the circuit patterned 92 is for mounting IC chips).

***Citation of Relevant Art***

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6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kaufman (US 4700273) discloses a circuit assembly with semiconductor expansion matched thermal path.

Anschel et al. (US 4914551) disclose an electronic package with heat spreader member.

Yamagata et al. (US 6123895) disclose an aluminum base member for semiconductor device containing a nitrogen rich surface and method for producing the same.

Nagatomo et al. (US 6310775) disclose a power module substrate.

Naba et al. (US 6426154) disclose a ceramic circuit board.

Osanai et al. (US 6938333) disclose a method of manufacturing a metal-ceramic circuit board.

### ***Conclusion***


7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoa C. Nguyen whose telephone number is 571-272-8293. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hoa C. Nguyen  
2/2/2006



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